Community-Acquired MRSA within the Pediatric Population of NYC

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Introduction and Selection of Community in Need

- What is MRSA?
  - Methicillin-resistant Staphylococcus aureus (MRSA) is a bacterium that has become resistant to several antibiotics. This bacteria can cause multiple complications including skin infections, pneumonia and sepsis. [1]
  - If resistant strains of bacteria, such as MRSA, remain a widespread epidemic, it can cause long term detrimental effects to the community leading to limited medication treatments for this infection.
  - The current national guidelines recommended for first-line treatment in these skin and soft tissue infections include trimethoprim-sulfamethoxazole and doxycycline. [2]
- Community in Need
  - The MRSA infection rate is higher among the pediatric population from Orthodox-associated zip codes compared to the rate of infection in other areas in Brooklyn.[2]
  - According to a study done by NYU Langone researchers, the community is at high risk due to an inherited gene mutation.[5]

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Problem in the Community

- The problem of antibiotic resistance limits available therapy rendering antibiotics ineffective to bacterial infections . [3]
- The pediatric population is particularly affected because MRSA thrives in crowded environments where there is skin-to-skin contact exposure. These environments include schools and daycares where children play sports and participate in other social activities [1]
- The pediatric population of the Orthodox Jewish community in Brooklyn has the highest prevalence rate of the infection.[9]
- When compared to other causes of hospitalization in NYC, researchers found that the pediatric population, especially those who are immunocompromised or come from low socioeconomic status were most likely to be hospitalized with CA-MRSA than the general population. [4]

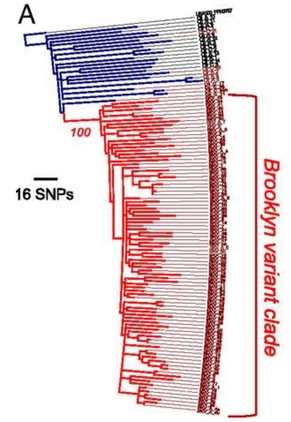
Community Assessment and Analysis

- The MRSA infection rate per 1,000 admissions was 10-fold higher among children from Orthodox-associated zip codes than that from other zip codes in New York City. [5] (p-value < 0.001)
- MRSA is two times more prevalent in children from Orthodox-associated “high-risk” zip codes compared to children coming from “low-risk” zip codes.[5]
- 93% (86/92) of the Orthodox community patients were consistent with carrying the Brooklyn strain of MRSA. [6]
- The Brooklyn variant clone of the infection was neither found in Manhattan nor in the Bronx.[6]
- The study conducted in NYC between 1997-2006 showed that children younger than 18 years old were more at risk for CA-MRSA related to hospitalization. [7] (p-value < 0.01)
- The study assessed the differences between immigrants and native-born patients in NYC and overall, both had similar rates of MRSA carriage whether they were wound infection related or nasal carriage. [7]

Proposed Solutions

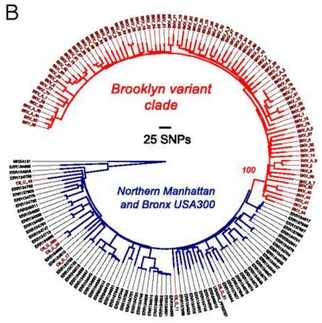
Bacterial Phylogeny reveals the emergence and spread of a dominant clone (USA300-BKV) in the Orthodox Jewish community. 92 isolates were obtained from patients (Shown in Red) representing the patients residing in Orthodox-associated zip codes compared with isolates from other adults and children in the same hospital that do not reside in the Orthodox Jewish community.

A



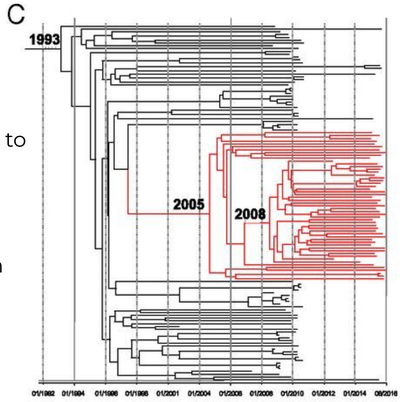
(A) Shown in red are the 16 USA300 MRSA gene isolates from adults and children in the same hospital. In blue are the isolates from Northern Manhattan and the Bronx.

B



(B) 68 USA300 strains from Northern Manhattan and the Bronx compared to the clone found in Brooklyn.

C



(C) The USA300-BKV gene, specific to the Jewish Orthodox population in Brooklyn, is highlighted in red.